Correlation between Educational Inequality and Income Inequality

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Abstract. The study of the relationship between education and income inequality is not a new topic, and scholars have been concerned with this issue for a long time. For the sake of social equity and poverty alleviation, governments should strengthen education for the poor. In recent years, with new advances in theories of economic growth and economic development and the emergence of new data, academic interest in the issue of income distribution has begun to grow again, focusing mainly on the determinants and dynamics of income distribution. Among them, the relationship between education and income inequality, which is an important form of human capital accumulation, has naturally become a hot issue in economics. This paper summarizes and reviews the recent studies on the relationship between education and income inequality from both theoretical and empirical perspectives.

Keywords: Education Inequality; Income Inequality; Gini Index.

1. Introduction

As cost-free education became more accessible to the general public, the educational attainment level increased in the recent years. For example, according to the data from Statista, the percentage of the Chinese population aged 25 and older that has reached a secondary level of education raised from 36.4% in 1990 to 79.2% in 2019[1]. However, the illiteracy varied from the highest of 28.09% in Tibet to 0.89% in Beijing [2]. According to Federal Reserve Bank of St. Louis, another interesting fact is that the income distribution in China shows similar pattern. The annual disposable income in China varies from about 10,000 in Tibet to about 50,000 in Beijing in 2015[3]. That leads to the question about how the educational inequality could affect the income inequality. The paper <Education, Inequality and Income Inequality> written in May 2001 by Daniele Checchi had a detailed discussion about this relationship, creating a formula to calculate Gini coefficient of educational attainment. it indicated that the correlation would change from positive to negative when the year of education reaches 6.48 years [4]. However, the paper used data in 1995 which fluctuated a lot over time. The paper <A NEW DATA SET OF EDUCATIONAL INEQUALITY IN THE WORLD, 1950–2010 GINI INDEX OF EDUCATION BY AGE GROUP> indicated that "Educational inequality has been declining for all regions and for all age groups during the last six decades" [5]. So, in my paper, I want to include some recent data to several regions, including Gini coefficient of educational attainment and Gini coefficient of income, provided other factors are the same, and to see that if this relationship is still an inverted-U-shaped and if it has changed from the result in 1995.

Income inequality can be affected by many factors, and as suggested by Anneli Kaasa, "If the analysis includes as many factors of income inequality as it is possible to include, it is reasonable to expect that the factors have causal interrelationships between themselves". These factors include:

2. Globalization

During globalization, more competitions occur, and international trade becomes a large fraction of daily transaction. Up to 1870, the sum of worldwide exports accounted for less than 10% of global output [6]. Today, the value of exported goods around the world is close to 25%. The fluctuation of currency. Recession of trade partners. These could all result in regional income inequality.

3. Change in Technology

As AI technology develops rapidly, workers in primary and secondary sectors bear the risks of being substituted by robots with higher productivity. Moreover, knowledge and skills about manipulating robots and new techniques may become the barrier that blocks low-skilled workers out of the labor market.

Considering the complex interrelationship, it is more plausible to talk about the correlation between distribution of education achievements and distribution of income than the causation. As mentioned in the 2001 paper, "Actual data indicate that average years of education have a stronger negative impact on measured income inequality. Income inequality is also negatively related to per capita income and positively related to capital/output ratio and government expenditure in education." By using the data of Gini index of educational attainment in 2006, I constructed a linear correlation between it and the Gini index of these countries in 2006. The data is listed below:

Table 1. Gini index data for educational attainment in 2006

Country Name	Gini index of education attainment (below upper secondary education in 2006)	Gini index of education attainment (upper secondary education in 2006)	Gini index of income (in 2006)
New Zealand	0.015	0.044	32.1
Netherlands	0.036	0.031	26.4
Mexico	0.051	0.118	47.1
Portugal	0.053	0.126	37
Belgium	0.059	0.120	27.64
Australia	0.061	0.101	32.53
Finland	0.065	0.034	26.8
United Kingdom	0.067	0.029	34.41
Italy	0.082	0.058	32.4
Sweden	0.086	0.040	24.19
Norway	0.088	0.038	29.24
Switzerland	0.089	0.036	30.5
France	0.091	0.059	27.47
Slovak Republic	0.091	0.051	25.1
Hungary	0.099	0.030	26.4
Austria	0.099	0.036	26.07
Spain	0.101	0.077	31.26
Ireland	0.104	0.019	32.51
Denmark	0.104	0.050	24.26
Canada	0.109	0.071	31.94
United States	0.133	0.040	38.4
Poland	0.137	0.029	31.21
Germany	0.138	0.043	29
Greece	0.144	0.071	34.29
Czech Republic	0.183	0.024	26.16
Korea	0.284	0.029	30.6

To unify the data, the data of Gini index of income was all calculated from the net income, using equalized and square root data. Using this table, two linear correlations were made:

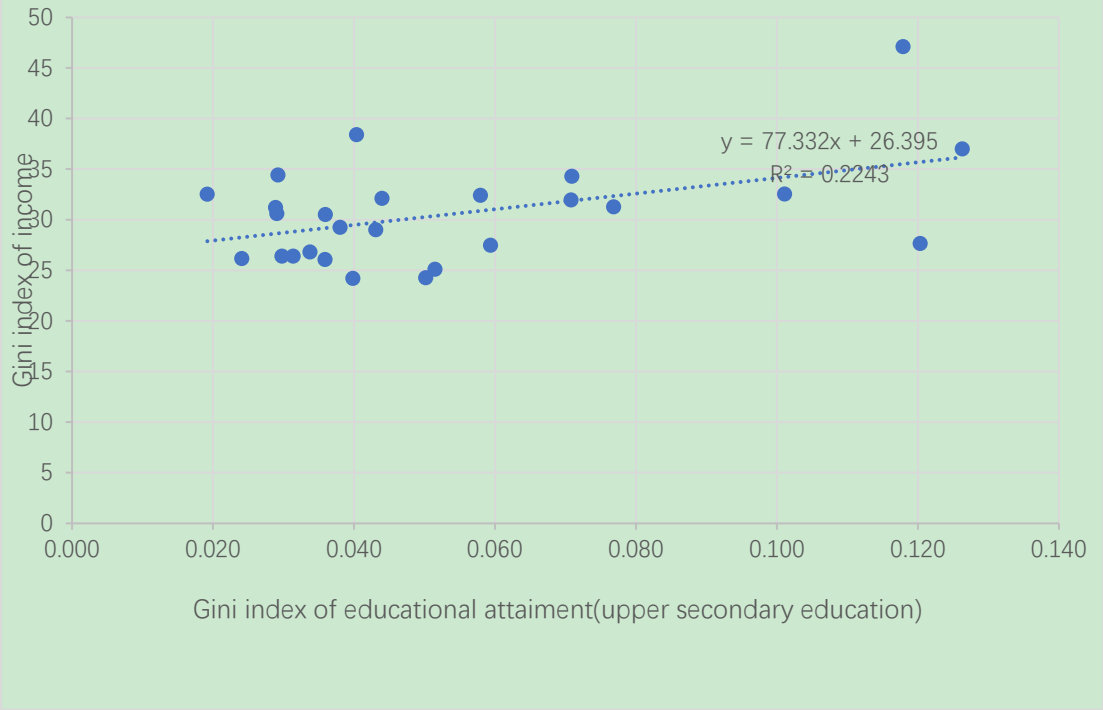

Figure 1. Gini index of educational attaiment (upper secondary education)

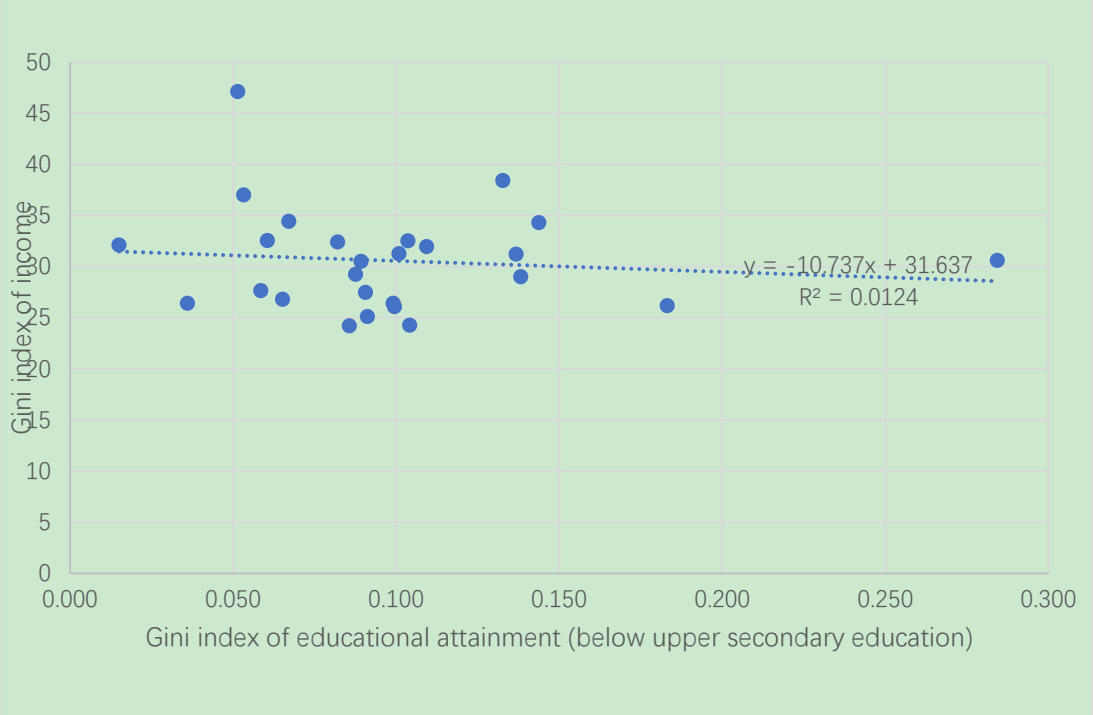

Figure 2. Gini index of educational attainment (below upper secondary education)

The figure 1 is the correlation between Gini index of education attainment (upper secondary education) (x-axis) and the Gini income of income(y-axis) in 2006. The figure 2 is the correlation between Gini index of education attainment (below upper secondary education) (x-axis) and the Gini index of income. Surprisingly, while we could find that there is positive correlation is figure 1 which suggested by the article, we could also find a negative correlation between Gini index of education attainment (below upper secondary education) (x-axis) and the Gini index of income.

This result could illustrate that:

The education attainment below upper secondary education may have less influence on people's income in the future, since almost no professional skills and knowledge were taught before the secondary education. Another explanation is that the inequality of primary education before can be reduced or reversed by other factors, leading to a reverse trend in income inequality.

After examining the data, it is worth to look back to the previous article. the author creatively proposed the idea of Gini index of educational attainment, and figured out the formula, as listed below, to calculate it:

$$G_{\text{ed}} = \frac{HC_h \cdot n_h \cdot (HC_s + HC_p + HC_n) + HC_s \cdot n_s \cdot (-HC_h + HC_p + HC_n) + HC_p \cdot n_p \cdot (-HC_h - HC_s + HC_n)}{\overline{HC}} =$$

$$= HC_n + \frac{HC_h HC_s (n_h - n_s) + HC_h HC_p (n_h - n_p) + HC_s HC_p (n_s - n_p)}{\overline{HC}}$$

Our result could correspond to the statement presented in the article that "For a given level of per capita income, income inequality has a U-shaped relationship with the average years of education in the population, with a turning point around 6.48 years". Since the correlation changes its sign when we change our examination from primary school to secondary school or higher. Its conclusion from the previous papers that "The decline in union presence in the workplace, the increased competition at international level, technological progress and all possible combinations of these are often indicated. However, the experiences at national level are very diversified, and it is quite hazardous to draw general conclusions" still works today and could illustrate nowadays phenomenon. The introduction of this idea could benefit future study about educational inequality. It gives valid conclusion since it is based on the considerations of many factors, including quality of human capital, the average year of education, and educational achievements and divided the education into different stages.

4. Conclusion

The limitation of my paper is that only two categories of education are provided. We can only confirm that the turning point is between 6 to 7 years, but how the figure "6.48" has changed over years is still unclear. Also, since income inequality could be affected by different factors in different regions, only a general conclusion is made without detailed explanation.

References

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